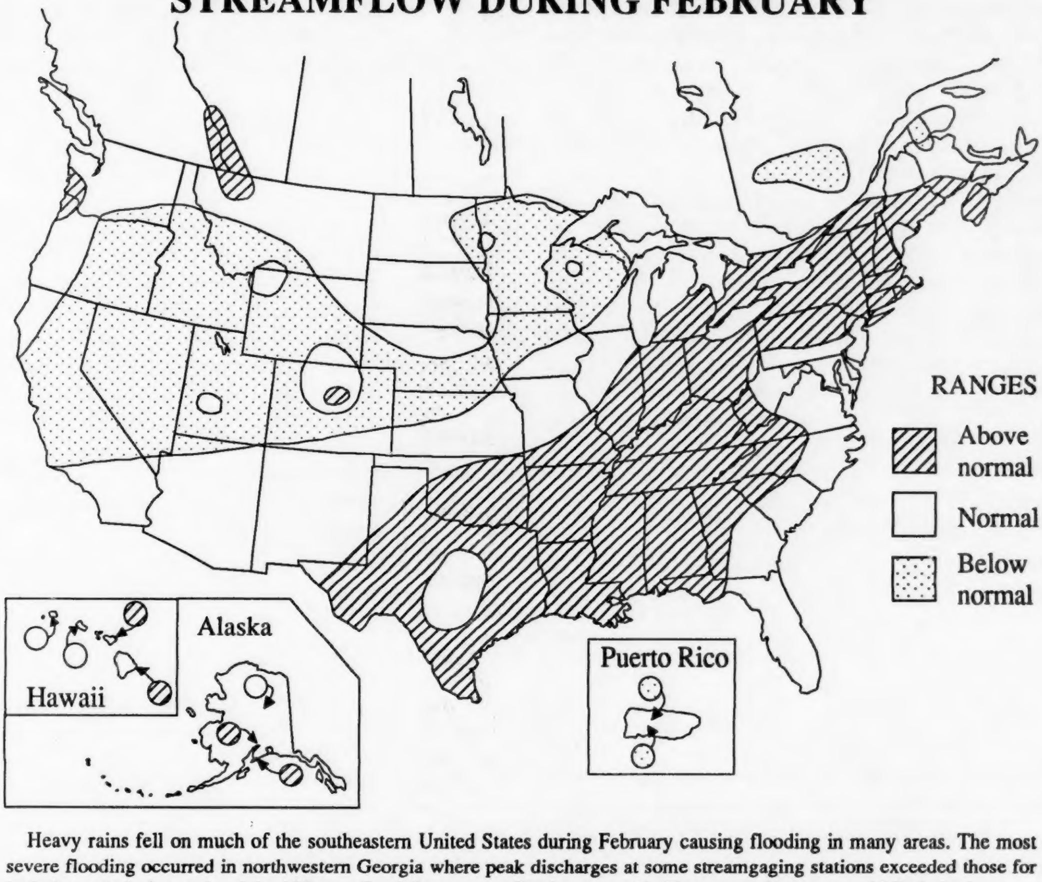
# National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

# FEBRUARY 1990

## STREAMFLOW DURING FEBRUARY




Heavy rains fell on much of the southeastern United States during February causing flooding in many areas. The most severe flooding occurred in northwestern Georgia where peak discharges at some streamgaging stations exceeded those for both the period of record and the 100-year flood. Less severe floods occurred in Tennessee, Alabama, and Mississippi.

Streamflow was in the normal to above-normal range at 76 percent of the index stations in southern Canada, the United States, and Puerto Rico during February, compared with 80 percent of stations in those ranges during January. Below-normal range streamflow occurred in 23 percent of the area of southern Canada and the conterminous United States during February compared with 11 percent during January. Total February 1990 flow for the index stations in the conterminous United States and southern Canada was 51 percent above median after a 51 percent increase in streamflow from January to February.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 41 percent above median and in the above-normal range during February, 65 percent more than during January. Flow of both the St. Lawrence River and the Mississippi River was in the above-normal range and flow of the Columbia River was in the below-normal range.

Monthend index reservoir contents were in the below-average range at 33 of 100 reporting sites. Contents were in the above-average range at 46 reservoirs. Lake Tahoe (California-Nevada) had no usable storage for the third consecutive month, while both Rye Patch (Nevada) and San Carlos (Arizona) had less than 10 percent of normal maximum contents.

Mean February elevations at the four master gages on the Great Lakes (provisional National Ocean Service data) were in the below-normal range on Lake Superior and Lake Huron, and in the normal range on Lake Erie and Lake Ontario.

Utah's Great Salt Lake rose 0.10 foot to 4,204.60 feet above National Geodetic Vertical Datum of 1929. The lake, which declined 2.40 feet from the seasonal high of April 1-15, has now risen 0.2 foot since January 1.

# SURFACE-WATER CONDITIONS DURING FEBRUARY 1990

Heavy rains fell on much of the southeastern United States during February causing minor to severe flooding in many areas. The most severe flooding occurred in northwestern Georgia (see map and table on page 3) where peak discharges at some streamgaging stations exceeded those for both the period of record and the 100-year flood. Less severe floods occurred in Tennessee, Alabama, and Mississippi.

In Tennessee, preliminary reports indicate that flood stages of record were exceeded on the Ocoee River at both Emf and Parksville, and on the South Chickamauga Creek near Chickamauga. South Chickamauga Creek in Chattanooga flooded many homes and businesses. Measurements made on South Chickamauga Creek February 16-17 indicated a peak discharge of 27,300 cubic feet per second (cfs), about 2,700 cfs less than the 1973 peak of record.

Heavy rains fell in northern Alabama during the afternoon and evening hours of Thursday, February 15, causing flash flooding along streams and creeks and serious flooding on major rivers. Rainfalls of 5.5-7.5 inches in 24 hours were recorded in the west-central counties of the State, however there were reports of around 9 inches in Shelby County (located southeast of Birmingham). Less than 1 inch of rain fell in the southern half of the State during the same period. Recurrence intervals for peak discharges ranged from about 5 years to over 100 years. For example, the February 16 peak discharge on Mulberry Fork near Garden City (about 30 miles north of Birmingham) was 65,500 cfs at a gage height of 25.05 feet, with the peak discharge exceeding both that for the 100-year flood and the previous peak of record (since 1900), and the peak stage exceeding that for the previous peak of record by 2.6 feet.

In Mississippi, 4-9 inches of rain fell February 15-16 in a 40-mile wide band extending from Wilkinson County in the southwestern part of the State to Noxubee County in the east-central part of the State. Recurrence intervals ranged from 10 years to slightly over 25 years on most streams with no record-breaking peaks reported.

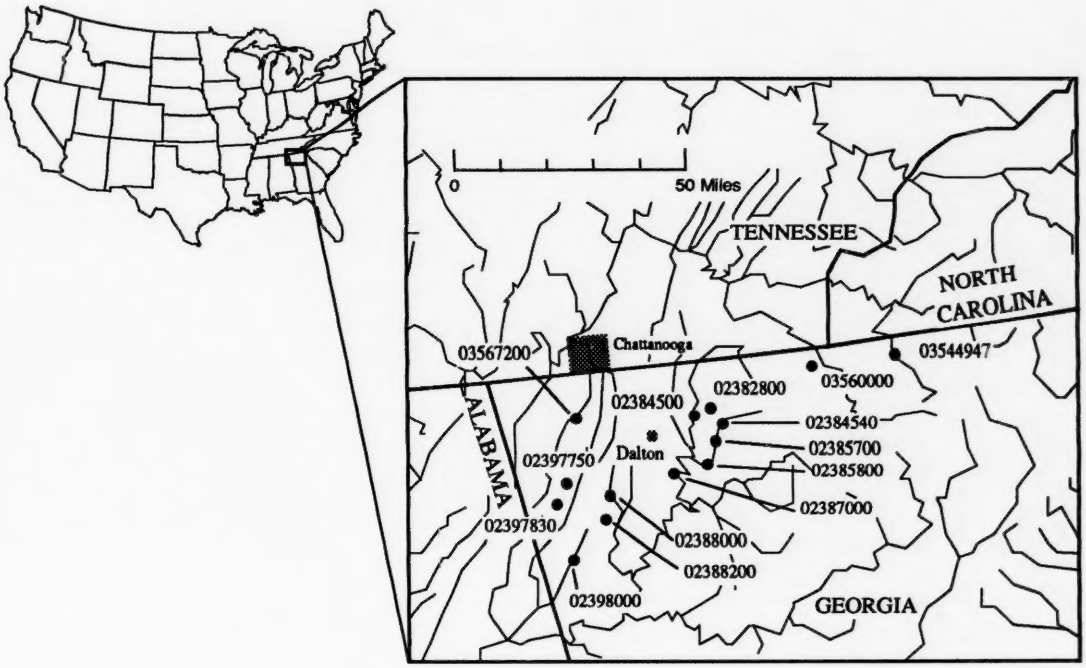
Streamflow was in the normal to above-normal range at 76 percent of the index stations in southern Canada, the United States, and Puerto Rico during February, compared with 80 percent of stations in those ranges during January, and 61 percent of stations in those ranges during February 1989. Below-normal range streamflow occurred in 23 percent of the area of southern Canada and the conterminous United States during February compared with 11 percent during January and 37 percent during February 1989. Total February 1990 flow of 3,054,000 cfs for the index stations in the conterminous United States and southern Canada was 51 percent above median after a 51 percent increase in streamflow from January to February, and 44 percent more than flow during February 1989.

Hydrographs for the index stations at which new extremes occurred are shown on page 5. Three new monthly lows and four new monthly highs occurred at streamflow index stations during February compared with one new high during January. The new lows were at stations in Wisconsin, Texas, and Puerto Rico, while the new highs were at stations in Alabama, Mississippi, Indiana, and North Carolina.

(Continued on page 11)

## CONTENTS

# FLOODS OF FEBRUARY 1990 IN GEORGIA



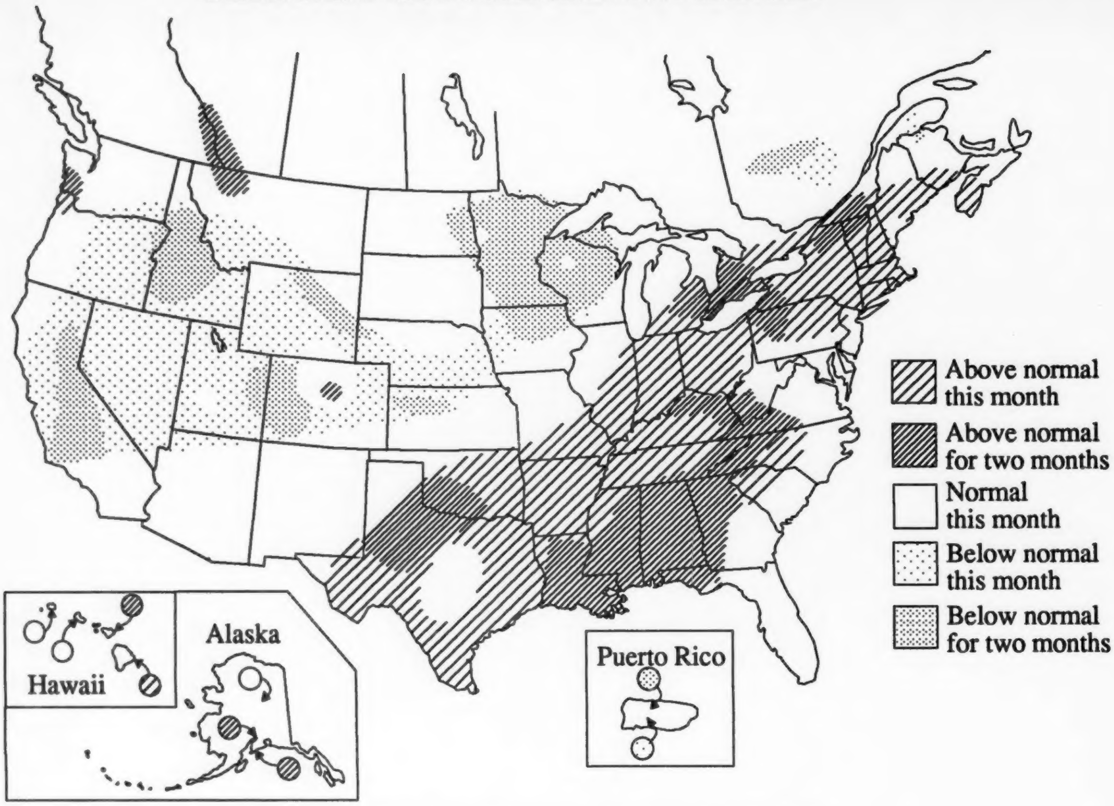

Provisional data; subject to revision

## FLOOD DATA FOR SELECTED SITES IN GEORGIA, FEBRUARY 1990

| WRD Station number | Stream and place of determination | Drainage area (square miles) | Period of known floods | Maximum flood previously known: Date | Maximum flood previously known: Stage (feet) | Maximum flood previously known: Discharge (cfs) | Maximum during present flood: Date | Maximum during present flood: Stage (feet) | Maximum during present flood: Discharge: Cfs | Maximum during present flood: Discharge: Cfs per square mile | Maximum during present flood: Recurrence interval (years) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **MOBILE RIVER BASIN** | | | | | | | | | | |
| 02382800 | Dry Creek at Oakman | 3.06 | 1965- | Apr. 4, 1977 | 8.45 | 1,410 | Feb. 16 | 5.73 | 1,020 | 333 | 50 |
| 02384500 | Conasauga River near Eton | 252 | 1954- | Mar. 17, 1973 | 18.59 | 25,200 | 16 | 20.60 | 35,000 | 139 | 1.3[a] |
| 02384540 | Mill Creek near Crandall | 8.27 | 1985- | Sept. 30, 1989 | 4.95 | 894 | 16 | 6.90 | 2,400 | 290 | 50 |
| 02385700 | Rock Creek near Chatsworth | 3.46 | 1965- | Mar. 4, 1979 | 5.63 | 750 | 16 | 9.42 | 2,300 | 665 | 2.5[a] |
| 02385800 | Holly Creek near Chatsworth | 64 | 1961- | Mar. 4, 1979 | 12.54 | 9,110 | 16 | 14.78 | 24,000 | 375 | 2.3[a] |
| 02387000 | Conasauga River at Tilton | 687 | 1886- | Apr. 1, 1886 | 34.00 | 40,000 | 17 | 29.89 | 36,000 | 52 | 50 |
| 02388000 | West Armuchee Creek near Subligna | 36.4 | 1951- | Mar. 29, 1951 | 12.10 | 12,400 | 16 | 14.01 | 22,000 | 604 | 2.1[a] |
| 02388200 | Stoney Mill Creek near Summerville | 6.02 | 1966- | Mar. 4, 1979 | 9.58 | 1,730 | 16 | 10.41 | 1,980 | 329 | 50 |
| 02397750 | Duck Creek near Lafayette | 6.34 | 1965- | Mar. 16, 1973 | 10.45 | 1,880 | 16 | 10.86 | 2,040 | 322 | 1.2[a] |
| 02397830 | Harrisburg Creek near Hawkins | 13.30 | 1980- | Jan. 20, 1988 | 11.20 | 4,260 | 16 | 12.00 | 5,500 | 414 | 1.6[a] |
| 02398000 | Chattooga River at Summerville | 192 | 1938- | Mar. 29, 1951 | 21.00 | 24,500 | 16 | 22.63 | 32,000 | 166 | 1.5[a] |
| | **TENNESSEE RIVER BASIN** | | | | | | | | | | |
| 03544947 | Brier Creek near Hiawassee | 1.70 | 1985- | Nov. 26, 1986 | 3.19 | 226 | 16 | 3.57 | 370 | 222 | 5 |
| 03560000 | Fightingtown Creek near McCaysville | 70.9 | 1943- | Mar. 29, 1951 | 11.92 | 5,420 | 16 | 17.34 | b | b | c |
| 03567200 | West Chickamauga Creek near Kensington | 73 | 1950- | Mar. 29, 1951 | 18.50 | 12,000 | 16 | 19.34 | 14,000 | 192 | 1.2[a] |

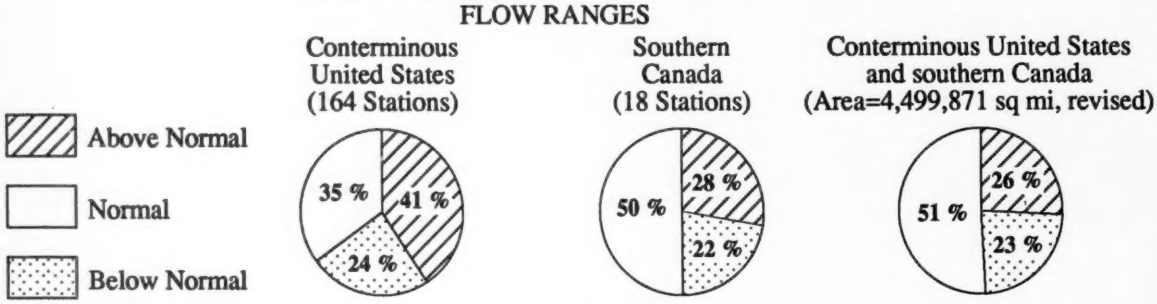
[a] Recurrence interval greater than 100 years. Value shown is approximate ratio of discharge to that of 100-year flood.
[b] Not determined.
[c] Not determined. Recurrence interval greater than 100 years.

## FEBRUARY 1990 STREAMFLOW RANGES

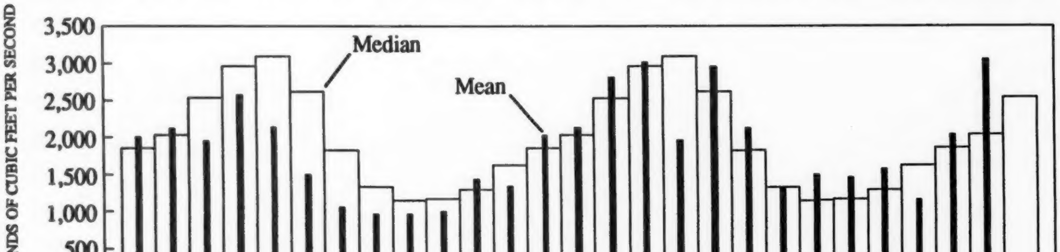



## SUMMARY OF FEBRUARY 1990 STREAMFLOW

FLOW RANGES

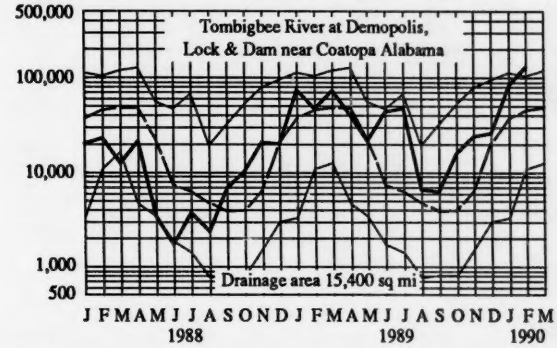



## COMPARISON OF TOTAL MONTHLY MEANS WITH TOTAL MONTHLY MEDIANS

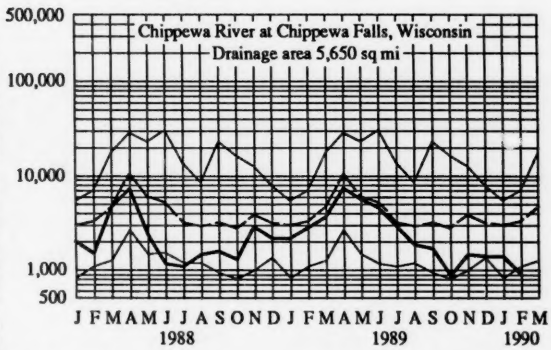


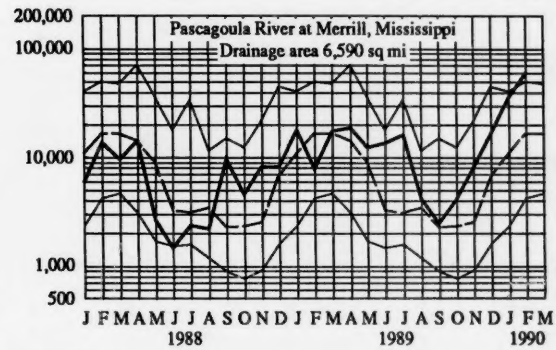
# MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

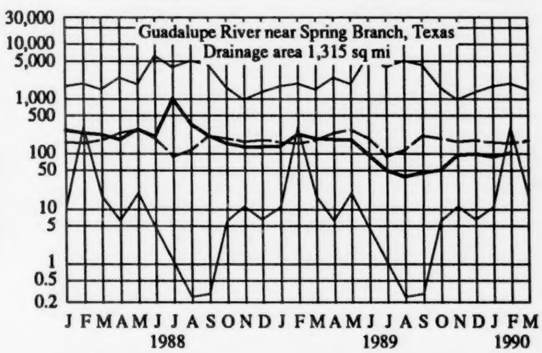
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.

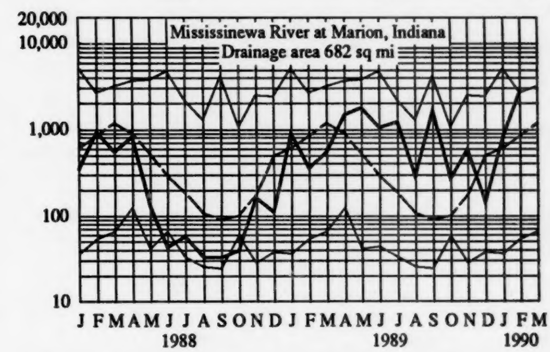



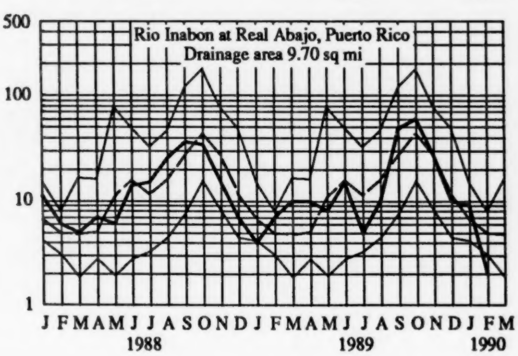

DISCHARGE IN CUBIC FEET PER SECOND

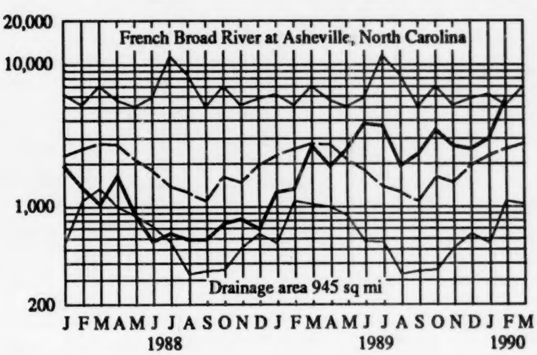


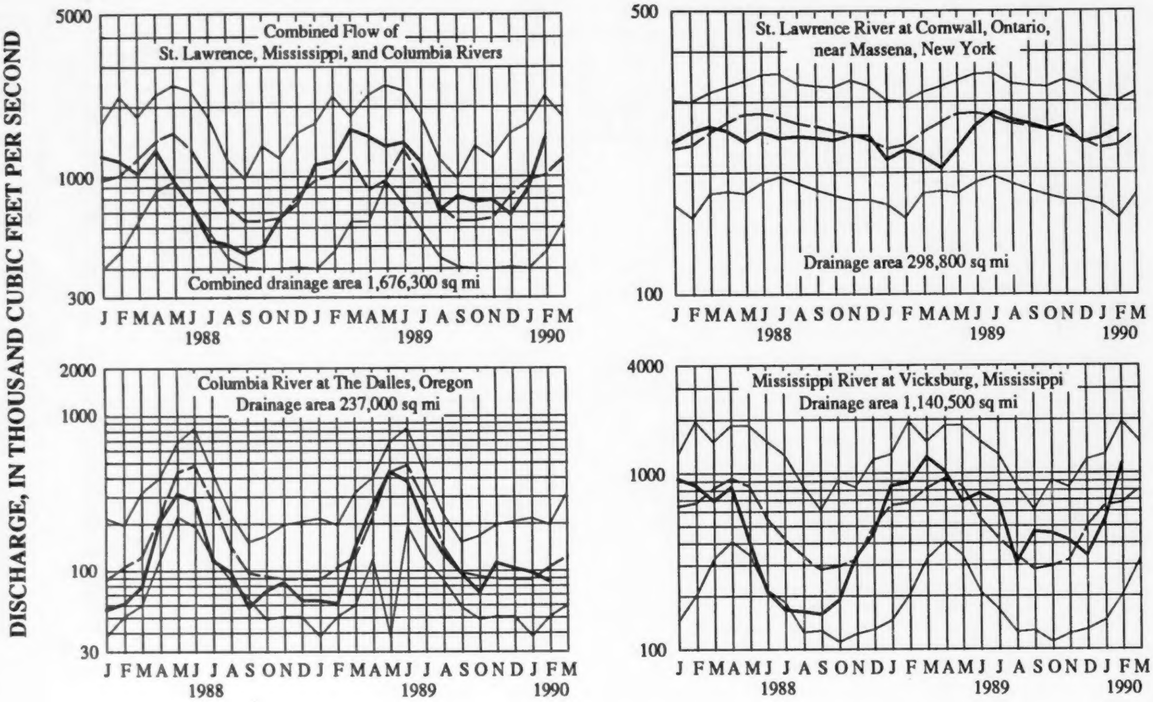



## HYDROGRAPHS FOR THE "BIG THREE" RIVERS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.




Provisional data; subject to revision

### DISSOLVED SOLIDS AND WATER TEMPERATURES, FOR FEBRUARY 1990, AT DOWNSTREAM SITES ON FIVE LARGE RIVERS

| Station number | Station name | February data of following calendar years | Stream discharge during month | Dissolved-solids concentration[a] | | Dissolved-solids discharge[a] | | | Water temperature[b] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean (cfs) | Minimum (mg/L) | Maximum (mg/L) | Mean (tons per day) | Minimum (tons per day) | Maximum (tons per day) | Mean in °C | Minimum in °C | Maximum in °C |
| 01463500 | Delaware River at Trenton, N.J. | 1990 | 23,160 | 80 | 93 | 5,313 | 3,871 | 8,327 | 4.0 | 2.0 | 6.0 |
| | (Morrisville, Pa.) | 1945-89 | 13,360 | 61 | 144 | 3,118[d] | 647 | 15,600 | 2.5[d] | 0.0 | 8.5 |
| | | (Extreme yr) | | (1954) | (1977) | | (1976) | (1984) | | | |
| | | | [c]12,240 | | | | | | | | |
| 07289000 | Mississippi River at Vicksburg, Miss. | 1990 | 1,119,000 | 166 | 219 | 546,000 | 427,500 | 614,700 | 9.5 | 7.5 | 11.0 |
| | | 1976-89 | 662,200 | 153 | 288 | 367,700 | 108,000 | 628,200 | 5.0 | 0.0 | 10.5 |
| | | (Extreme yr) | | (1989) | (1986) | | (1977) | (1986) | | | |
| | | | [c]672,800 | | | | | | | | |
| 03612500 | Ohio River at lock and dam 53, near Grand Chain, Ill. (streamflow station at Metropolis, Ill.) | 1990 | 926,700 | 139 | 223 | ...... | 288,000 | 648,000 | ... | 6.0 | 9.0 |
| | | 1955-89 | 437,600 | 98 | 308 | ...... | 44,900 | 419,000 | ... | 0.0 | 10.0 |
| | | (Extreme yr) | | (1957) | (1967) | | (1955) | (1974) | | | |
| | | | [c]410,900 | | | | | | | | |
| 06934500 | Missouri River at Hermann, Mo. (60 miles west of St. Louis, Mo.) | 1990 | 48,360 | 330 | 440 | 50,900 | 36,800 | 74,300 | 5.5 | 4.0 | 7.0 |
| | | 1976-89 | 69,860 | 205 | 537 | 71,610 | 23,500 | 237,000 | 3.5 | 0.0 | 12.0 |
| | | (Extreme yr) | | (1985) | (1985) | | (1977) | (1985) | | | |
| | | | [c]49,190 | | | | | | | | |
| 14128910 | Columbia River at Warrendale, Oreg. (streamflow station at The Dalles, Oreg.) | 1990 | 175,000 | 98 | 105 | 48,400 | 35,200 | 58,700 | 5.5 | 4.5 | 6.0 |
| | | 1976-89 | 165,200 | 87 | 128 | 51,000 | 24,500 | 106,500 | 3.5 | 0.5 | 7.0 |
| | | (Extreme yr) | | (1976) | (1977, 1986) | | (1989) | (1982) | | | |
| | | | [c]104,800 | | | | | | | | |

[a]Dissolved -solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: [(1.8 x °C) + 32] = °F.
[c]Median of monthly values for 30-year reference period, water years 1951-80, for comparison with data for current month.
[d]Mean for 6-year period (1984-89).

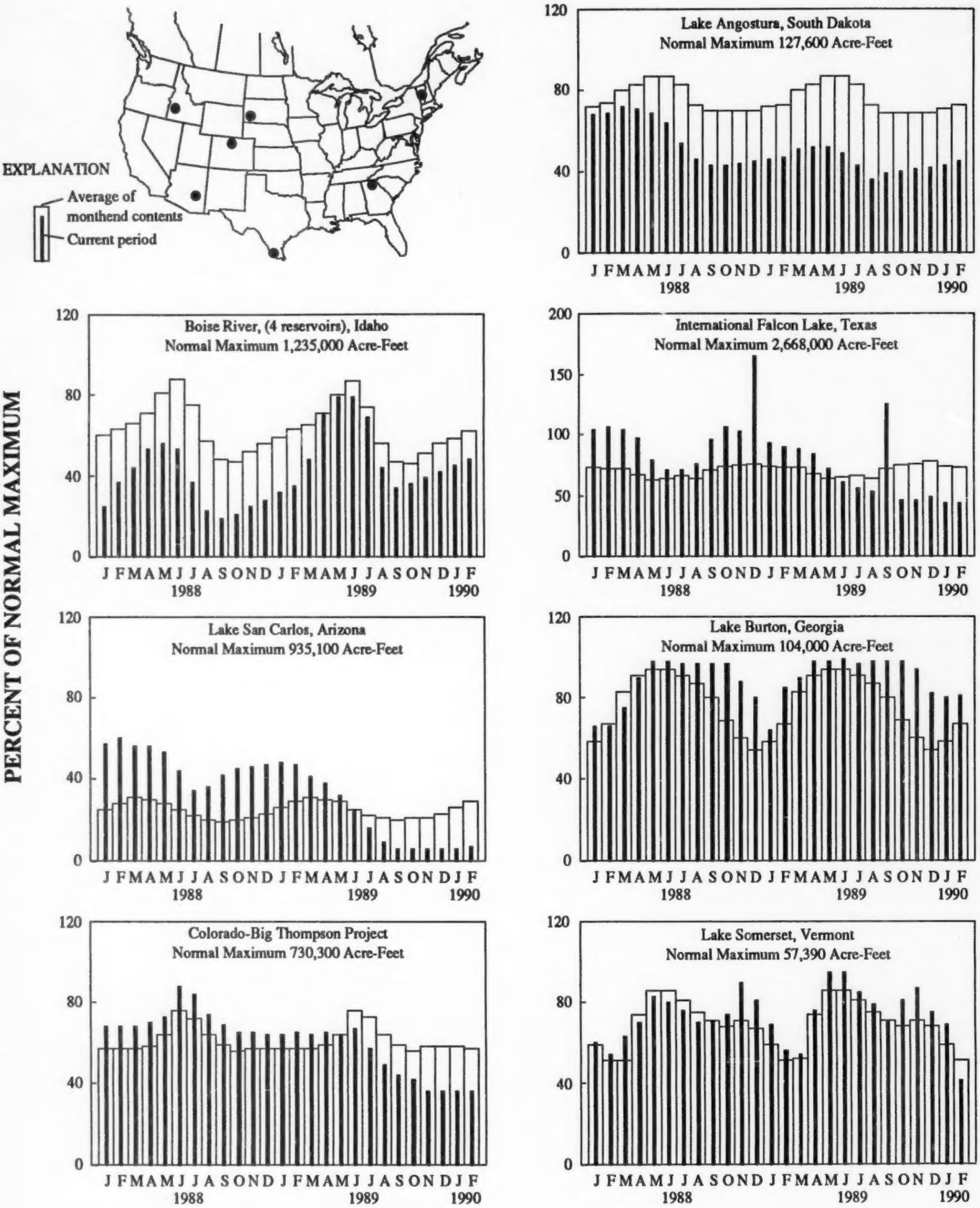
Provisional data; subject to revision

# FLOW OF LARGE RIVERS DURING FEBRUARY 1990

| Station number | Stream and place of determination | Drainage area (square miles) | Average discharge through September 1985 (cubic feet per second) | February 1990: Monthly mean discharge (cubic feet per second) | February 1990: Percent of median monthly discharge 1951–80 | February 1990: Change in discharge from previous month (percent) | Discharge near end of month: Cubic feet per second | Discharge near end of month: Million gallons per day | Discharge near end of month: Date |
|---|---|---|---|---|---|---|---|---|---|
| 01014000 | St. John River below Fish River at Fort Kent, Maine | 5,665 | 9,758 | 2,918 | 148 | 17 | 2,600 | 1,680 | 28 |
| 01318500 | Hudson River at Hadley, New York | 1,664 | 2,908 | 3,620 | 212 | 90 | 5,200 | 3,360 | 28 |
| 01357500 | Mohawk River at Cohoes, New York | 3,456 | 5,683 | 11,300 | 227 | 99 | 6,000 | 3,900 | 28 |
| 01463500 | Delaware River at Trenton, New Jersey | 6,780 | 11,670 | 23,160 | 189 | 83 | 16,000 | 10,300 | 28 |
| 01570500 | Susquehanna River at Harrisburg, Pennsylvania | 24,100 | 34,340 | 80,000 | 198 | 171 | 48,300 | 31,200 | 25 |
| 01646500 | Potomac River near Washington, District of Columbia | 11,560 | [1]11,500 | [1]17,600 | 110 | 26 | ...... | ...... | ... |
| 02105500 | Cape Fear River at William O. Huske Lock, near Tarheel, North Carolina. | 4,852 | 5,002 | 8,720 | 97 | 18 | ...... | ...... | ... |
| 02131000 | Pee Dee River at Peedee, South Carolina | 8,830 | 9,871 | 25,770 | 169 | 64 | 37,500 | 24,200 | 28 |
| 02226000 | Altamaha River at Doctortown, Georgia | 13,600 | 13,730 | 28,520 | 129 | –10 | 39,400 | 25,500 | 28 |
| 02320500 | Suwannee River at Branford, Florida | 7,880 | 6,986 | 8,423 | 104 | 27 | 11,000 | 7,100 | 28 |
| 02358000 | Apalachicola River at Chattahoochee, Florida | 17,200 | 22,420 | 53,420 | 168 | 5 | 62,300 | 40,300 | 28 |
| 02467000 | Tombigbee River at Demopolis lock and dam, near Coatopa, Alabama. | 15,385 | 23,520 | 129,100 | 287 | 57 | 81,600 | 52,700 | 28 |
| 02489500 | Pearl River near Bogalusa, Louisiana | 6,573 | 9,880 | 46,000 | 270 | 29 | 44,800 | 29,000 | 28 |
| 03049500 | Allegheny River at Natrona, Pennsylvania | 11,410 | [1]19,580 | [1]53,000 | 207 | 56 | 38,600 | 25,000 | 26 |
| 03085000 | Monongahela River at Braddock, Pennsylvania | 7,337 | [1]12,480 | [1]24,000 | 130 | 9 | 10,300 | 6,660 | 25 |
| 03193000 | Kanawha River at Kanawha Falls, West Virginia | 8,367 | 12,550 | 28,900 | 152 | 7 | 14,700 | 9,500 | 27 |
| 03234500 | Scioto River at Higby, Ohio | 5,131 | 4,583 | 16,470 | 229 | 137 | 5,200 | 3,360 | 28 |
| 03294500 | Ohio River at Louisville, Kentucky[2] | 91,170 | 115,800 | 363,000 | 207 | 61 | 194,000 | 126,000 | 27 |
| 03377500 | Wabash River at Mount Carmel, Illinois | 28,635 | 27,660 | 72,160 | 194 | 158 | 82,400 | 53,300 | 28 |
| 03469000 | French Broad River below Douglas Dam, Tennessee | 4,543 | [1]6,739 | 21,200 | 207 | 59 | ...... | ...... | ... |
| 04084500 | Fox River at Rapide Croche Dam, near Wrightstown, Wisconsin.[2] | 6,010 | 4,238 | 2,570 | 71 | –1 | 2,700 | 1,740 | 28 |
| 04264331 | St. Lawrence River at Cornwall, Ontario, near Massena, New York.[3] | 298,800 | 243,900 | 254,000 | 109 | 5 | 260,000 | 168,000 | 28 |
| 02NG001 | St. Maurice River at Grand Mere, Quebec | 16,300 | 24,910 | 3,890 | 63 | –41 | 14,000 | 9,000 | 25 |
| 05082500 | Red River of the North at Grand Forks, North Dakota | 30,100 | 2,593 | 274 | 25 | 45 | 315 | 203 | 28 |
| 05133500 | Rainy River at Manitou Rapids, Minnesota | 19,400 | 12,920 | 5,500 | 59 | 6 | 5,500 | 3,550 | 27 |
| 05330000 | Minnesota River near Jordan, Minnesota | 16,200 | 3,680 | 285 | 56 | 20 | 284 | 183 | 28 |
| 05331000 | Mississippi River at St. Paul, Minnesota | 36,800 | [1]11,020 | 2,760 | 56 | –2 | 2,750 | 1,780 | 28 |
| 05365500 | Chippewa River at Chippewa Falls, Wisconsin | 5,650 | 5,149 | 890 | 27 | –36 | 1,050 | 678 | 27 |
| 05407000 | Wisconsin River at Muscoda, Wisconsin | 10,400 | 8,710 | 5,468 | 79 | 23 | 3,500 | 2,260 | 28 |
| 05446500 | Rock River near Joslin, Illinois | 9,549 | 6,080 | 4,530 | 102 | 33 | 4,100 | 2,650 | 31 |
| 05474500 | Mississippi River at Keokuk, Iowa | 119,000 | 63,790 | 26,960 | 65 | 14 | 26,700 | 17,300 | 28 |
| 06214500 | Yellowstone River at Billings, Montana | 11,795 | 7,056 | 2,453 | 91 | –12 | 3,110 | 2,010 | 28 |
| 06934500 | Missouri River at Hermann, Missouri | 524,200 | 80,880 | 48,360 | 98 | 56 | 73,500 | 47,500 | 26 |
| 07289000 | Mississippi River at Vicksburg, Mississippi[4] | 1,140,500 | 584,000 | 1,119,000 | 166 | 106 | 1,320,000 | 852,000 | 26 |
| 07331000 | Washita River near Dickson, Oklahoma | 7,202 | 1,402 | 1,736 | 421 | –10 | 2,570 | 1,660 | 28 |
| 08276500 | Rio Grande below Taos Junction Bridge, near Taos, New Mexico. | 9,730 | 742 | 426 | 88 | 14 | 506 | 327 | 28 |
| 09315000 | Green River at Green River, Utah | 44,850 | 6,391 | 1,914 | 64 | –1 | ...... | ...... | ... |
| 11425500 | Sacramento River at Verona, California | 21,251 | 19,430 | 12,730 | 33 | –26 | ...... | ...... | ... |
| 13269000 | Snake River at Weiser, Idaho | 69,200 | 18,520 | 10,800 | 55 | –4 | 11,900 | 7,690 | 28 |
| 13317000 | Salmon River at White Bird, Idaho | 13,550 | 11,390 | 3,310 | 72 | –6 | 3,560 | 2,300 | 28 |
| 13342500 | Clearwater River at Spalding, Idaho | 9,570 | 15,510 | 6,110 | 62 | 83 | 8,800 | 5,690 | 28 |
| 14105700 | Columbia River at The Dalles, Oregon[5] | 237,000 | [1]193,500 | [1]84,370 | 81 | –13 | 185,000 | 120,000 | 28 |
| 14191000 | Willamette River at Salem, Oregon | 7,280 | [1]23,690 | [1]46,590 | 101 | 20 | 29,100 | 18,800 | 28 |
| 15515500 | Tanana River at Nenana, Alaska | 25,600 | 23,810 | 7,493 | 117 | –11 | 7,000 | 4,500 | 28 |
| 08MF005 | Fraser River at Hope, British Columbia | 83,800 | 96,250 | 31,600 | 93 | –27 | 33,900 | 21,900 | 28 |

[1]Adjusted.
[2]Records furnished by Corps of Engineers.
[3]Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y., when adjusted for storage in Lake St. Lawrence.
[4]Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5]Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

# USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS



# USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF FEBRUARY 1990

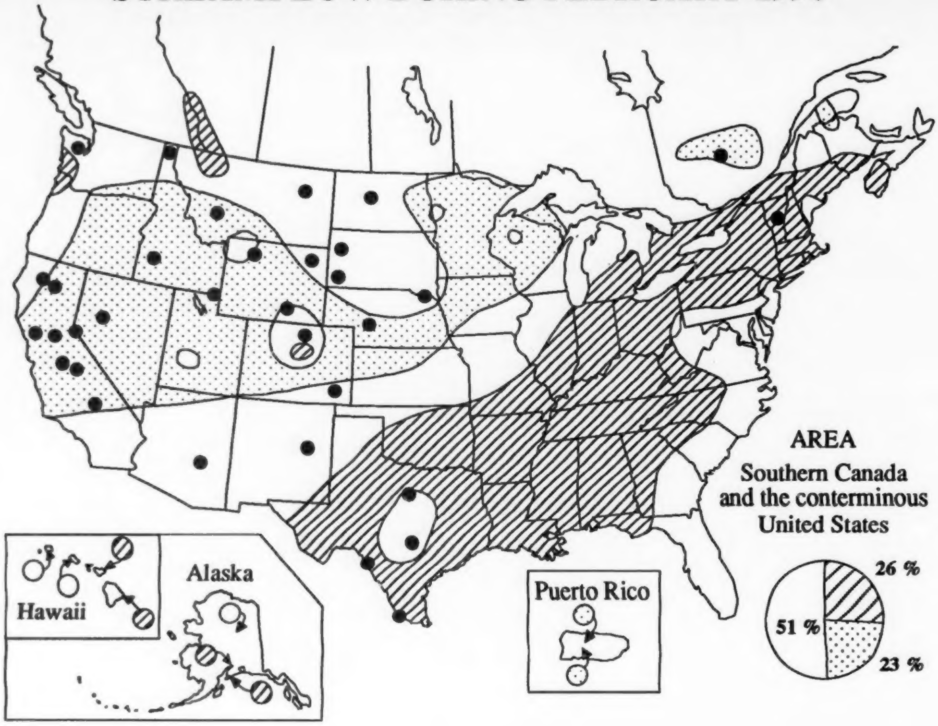
[Contents are expressed in percent of reservoir (system) capacity. The usable storage capacity of each reservoir (system) is shown in the column headed "Normal maximum"]

| Reservoir<br>Principal uses:<br>F-Flood control<br>I-Irrigation<br>M-Municipal<br>P-Power<br>R-Recreation<br>W-Industrial | Percent of normal maximum: End of February 1990 | End of February 1989 | Average for end of February | End of January 1990 | Normal maximum (acre-feet)[a] |
|---|---|---|---|---|---|
| **NOVA SCOTIA** | | | | | |
| Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P) | 56 | 51 | 59 | 46 | [b]226,300 |
| **QUEBEC** | | | | | |
| Allard (P) | 52 | 18 | 30 | 52 | 280,600 |
| Gouin (P) | 44 | 58 | 52 | 50 | 6,954,000 |
| **MAINE** | | | | | |
| Seven Reservoir Systems (MP) | 42 | 34 | 40 | 49 | 4,107,000 |
| **NEW HAMPSHIRE** | | | | | |
| First Connecticut Lake (P) | 30 | 29 | 20 | 47 | 76,450 |
| Lake Francis (FPR) | 47 | 42 | 31 | 52 | 99,310 |
| Lake Winnipesaukee (PR) | 61 | 55 | 51 | 59 | 165,700 |
| **VERMONT** | | | | | |
| Harriman (P) | 61 | 48 | 32 | 58 | 116,200 |
| Somerset (P) | 41 | 56 | 51 | 69 | 57,390 |
| **MASSACHUSETTS** | | | | | |
| Cobble Mountain and Borden Brook (MP) | 93 | 76 | 69 | 86 | 77,920 |
| **NEW YORK** | | | | | |
| Great Sacandaga Lake (FPR) | 48 | 35 | 36 | 54 | 786,700 |
| Indian Lake (FMP) | 74 | 54 | 42 | 70 | 103,300 |
| New York City Reservoir System (MW) | 96 | 56 | 83 | 89 | 1,680,000 |
| **NEW JERSEY** | | | | | |
| Wanaque (M) | 98 | 82 | 80 | 89 | 77,450 |
| **PENNSYLVANIA** | | | | | |
| Allegheny (FPR) | 36 | 36 | 26 | 32 | 1,180,000 |
| Pymatuning (FMR) | 96 | 91 | 85 | 88 | 188,000 |
| Raystown Lake (FR) | 67 | 68 | 57 | 67 | 761,900 |
| Lake Wallenpaupack (PR) | 68 | 57 | 51 | 66 | 157,800 |
| **MARYLAND** | | | | | |
| Baltimore Municipal System (M) | 93 | 75 | 88 | 89 | 261,900 |
| **NORTH CAROLINA** | | | | | |
| Bridgewater (Lake James) (P) | 98 | 95 | 84 | 87 | 288,800 |
| Narrows (Badin Lake) (P) | 98 | 100 | 100 | 95 | 128,900 |
| High Rock Lake (P) | 96 | 89 | 74 | 92 | 234,800 |
| **SOUTH CAROLINA** | | | | | |
| Lake Murray (P) | 91 | 89 | 71 | 90 | 1,614,000 |
| Lakes Marion and Moultrie (P) | 89 | 73 | 76 | 72 | 1,862,000 |
| **SOUTH CAROLINA-GEORGIA** | | | | | |
| Strom Thurmond Lake (FP) | 79 | 21 | 66 | 76 | 1,730,000 |
| **GEORGIA** | | | | | |
| Burton (PR) | 81 | 85 | 67 | 80 | 104,000 |
| Sinclair (MPR) | 89 | 91 | 87 | 96 | 214,000 |
| Lake Sidney Lanier (FMPR) | 65 | 40 | 56 | 67 | 1,686,000 |
| **ALABAMA** | | | | | |
| Lake Martin (P) | 95 | 79 | 76 | 94 | 1,375,000 |
| **TENNESSEE VALLEY** | | | | | |
| Clinch Projects: Norris and Melton Hill Lakes (FPR) | 49 | 50 | 39 | 44 | 2,293,000 |
| Douglas Lake (FPR) | 34 | 27 | 22 | 20 | 1,395,000 |
| Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR) | 66 | 58 | 49 | 56 | 1,012,000 |
| Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR) | 54 | 54 | 42 | 52 | 2,880,000 |
| Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR) | 69 | 55 | 47 | 22 | 1,478,000 |
| **WISCONSIN** | | | | | |
| Chippewa and Flambeau (PR) | 66 | 67 | 28 | 74 | 365,000 |
| Wisconsin River (21 Reservoirs) (PR) | 29 | 31 | 19 | 33 | 399,000 |
| **MINNESOTA** | | | | | |
| Mississippi River Headwater System (FMR) | 29 | 27 | 18 | 28 | 1,640,000 |
| **NORTH DAKOTA** | | | | | |
| Lake Sakakawea (Garrison) (FIPR) | 57 | 58 | 78 | 58 | 22,700,000 |
| **SOUTH DAKOTA** | | | | | |
| Angostura (I) | 45 | 47 | 73 | 43 | 130,770 |
| Belle Fourche (I) | 37 | 39 | 53 | 32 | 185,200 |
| Lake Francis Case (FIP) | 71 | 75 | 76 | 65 | 4,589,000 |
| Lake Oahe (FIP) | 63 | 65 | ... | 61 | 22,240,000 |
| Lake Sharpe (FIP) | 101 | 100 | 99 | 100 | 1,697,000 |
| Lewis and Clark Lake (FIP) | 83 | 82 | 89 | 100 | 432,000 |
| **NEBRASKA** | | | | | |
| Lake McConaughy (IP) | 68 | 76 | 75 | 66 | 1,948,000 |
| **OKLAHOMA** | | | | | |
| Eufaula (FPR) | 103 | 103 | 88 | 101 | 2,378,000 |
| Keystone (FPR) | 96 | 88 | 92 | 84 | 661,000 |
| Tenkiller Ferry (FPR) | 108 | 105 | 92 | 110 | 628,200 |
| Lake Altus (FIMR) | 90 | 82 | 53 | 82 | 133,000 |
| Lake O'The Cherokees (FPR) | 99 | 91 | 82 | 99 | 1,492,000 |
| **OKLAHOMA-TEXAS** | | | | | |
| Lake Texoma (FMPRW) | 92 | 94 | 88 | 94 | 2,722,000 |
| **TEXAS** | | | | | |
| Bridgeport (IMW) | 90 | 61 | 48 | 89 | 386,400 |
| Canyon (FMR) | 84 | 98 | 81 | 85 | 385,600 |
| International Amistad (FIMPW) | 72 | 101 | 84 | 78 | 3,497,000 |
| International Falcon (FIMPW) | 44 | 90 | 73 | 44 | 2,668,000 |
| Livingston (IMW) | 102 | 102 | 90 | 104 | 1,788,000 |
| Possum Kingdom (IMPRW) | 87 | 70 | 93 | 86 | 570,200 |
| Red Bluff (P) | 32 | 59 | 32 | 31 | 307,000 |
| Toledo Bend (P) | 101 | 91 | 87 | 97 | 4,472,000 |
| Twin Buttes (FIM) | 48 | 73 | 35 | 48 | 177,800 |
| Lake Kemp (IMW) | 96 | 62 | 85 | 95 | 268,000 |
| Lake Meredith (FMW) | 39 | 41 | 36 | 39 | 796,900 |
| Lake Travis (FIMPRW) | 64 | 82 | 82 | 64 | 1,144,000 |
| **MONTANA** | | | | | |
| Canyon Ferry (FIMPR) | 69 | 62 | 77 | 72 | 2,043,000 |
| Fort Peck (FPR) | 57 | 63 | 80 | 59 | 18,910,000 |
| Hungry Horse (FIPR) | 71 | 37 | 63 | 75 | 3,451,000 |
| **WASHINGTON** | | | | | |
| Ross (PR) | 39 | 17 | 40 | 63 | 1,052,000 |
| Franklin D. Roosevelt Lake (IP) | 90 | 25 | 67 | 96 | 5,022,000 |
| Lake Chelan (PR) | 44 | 36 | 35 | 56 | 676,100 |
| Lake Cushman (PR) | 22 | 45 | 82 | 22 | 359,500 |
| Lake Merwin (P) | 100 | 99 | 96 | 98 | 245,600 |
| **IDAHO** | | | | | |
| Boise River (4 Reservoirs) (FIP) | 48 | 35 | 62 | 45 | 1,235,000 |
| Coeur d'Alene Lake (P) | 50 | 13 | 52 | 57 | 238,500 |
| Pend Oreille Lake (FP) | 39 | 29 | 51 | 31 | 1,561,000 |
| **IDAHO-WYOMING** | | | | | |
| Upper Snake River (8 Reservoirs) (MP) | 73 | 47 | 69 | 66 | 4,401,000 |
| **WYOMING** | | | | | |
| Boysen (FIP) | 70 | 63 | 67 | 73 | 802,000 |
| Buffalo Bill (IP) | 53 | 39 | 61 | 53 | 421,300 |
| Keyhole (F) | 23 | 27 | 42 | 20 | 193,800 |
| Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I) | 38 | 54 | 51 | 37 | 3,056,000 |
| **COLORADO** | | | | | |
| John Martin (FIR) | 17 | 32 | 23 | 14 | 364,400 |
| Taylor Park (IR) | 65 | 61 | 55 | 67 | 106,200 |
| Colorado-Big Thompson Project (I) | 36 | 65 | 57 | 36 | 730,300 |
| **COLORADO RIVER STORAGE PROJECT** | | | | | |
| Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR) | 72 | 81 | ... | 73 | 31,620,000 |
| **UTAH-IDAHO** | | | | | |
| Bear Lake (IPR) | 52 | 58 | 58 | 51 | 1,421,000 |
| **CALIFORNIA** | | | | | |
| Folsom (FIP) | 36 | 37 | 58 | 34 | 1,000,000 |
| Hetch Hetchy (MP) | 26 | 28 | 30 | 33 | 360,400 |
| Isabella (FIR) | 14 | 12 | 30 | 15 | 568,100 |
| Pine Flat (FI) | 9 | 14 | 56 | 7 | 1,001,000 |
| Clair Engle Lake (Lewiston) (P) | 54 | 53 | 78 | 53 | 2,438,000 |
| Lake Almanor (P) | 72 | 65 | 53 | 69 | 1,036,000 |
| Lake Berryessa (FIMW) | 51 | 59 | 86 | 50 | 1,600,000 |
| Millerton Lake (FI) | 40 | 45 | 65 | 35 | 503,200 |
| Shasta Lake (FIPR) | 54 | 42 | 75 | 52 | 4,377,000 |
| **CALIFORNIA-NEVADA** | | | | | |
| Lake Tahoe (IPR) | 0 | 0 | 52 | 0 | 744,600 |
| **NEVADA** | | | | | |
| Rye Patch (I) | 8 | 4 | 57 | 6 | 194,300 |
| **ARIZONA-NEVADA** | | | | | |
| Lake Mead and Lake Mohave (FIMP) | 83 | 89 | 70 | 83 | 27,970,000 |
| **ARIZONA** | | | | | |
| San Carlos (IP) | 7 | 47 | 29 | 6 | 935,100 |
| Salt and Verde River System (IMPR) | 50 | 81 | 49 | 49 | 2,019,100 |
| **NEW MEXICO** | | | | | |
| Conchas (FIR) | 67 | 81 | 83 | 66 | 315,700 |
| Elephant Butte and Caballo (FIPR) | 75 | 87 | 40 | 74 | 2,397,000 |

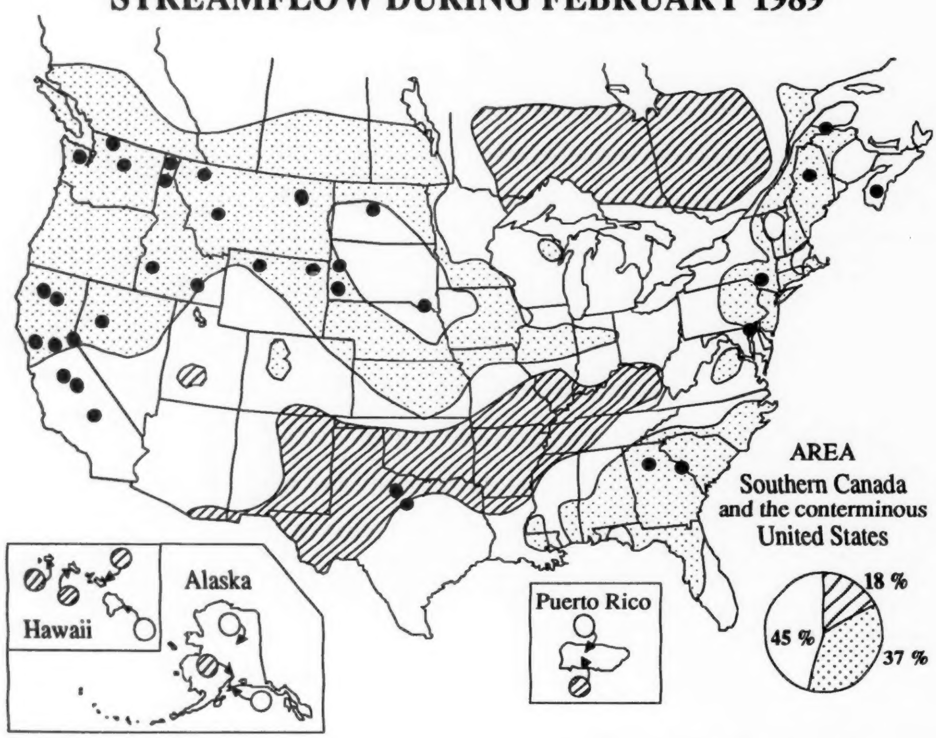
[a]1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second per day.

[b]Thousands of kilowatt-hours ( the potential electric power that could be generated by the volume of water in storage).

## STREAMFLOW DURING FEBRUARY 1990




## STREAMFLOW DURING FEBRUARY 1989




Above-normal range    Below-normal range    • Below-average reservoir storage

## NEW EXTREMES DURING FEBRUARY 1990 AT STREAMFLOW INDEX STATIONS

| | | | Previous February extremes (period of record) | | | February 1990 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Station number | Stream and place of determination | Drainage area (square miles) | Years of record | Monthly mean in cfs (year) | Daily mean in cfs (year) | Monthly mean in cfs | Percent of median | Daily mean in cfs | Day |
| | LOW FLOWS | | | | | | | | |
| 05365500 | Chippewa River at Chippewa Falls, Wisconsin | 5,650 | 77 | 1,091 (1917) | 40.0 (1917) | 890 | 26 | 90.0 | 17 |
| 08167500 | Guadalupe River near Spring Branch, Texas | 1,315 | 67 | 29.3 (1956) | 12.0 (1957) | 103 | 67 | 86.0 | 99 |
| 50112500 | Rio Inabon at Real Abajo, Puerto Rico | 9.70 | 23 | 3.05 (1977) | 1.40 (1967) | 2.97 | 59 | 1.08 | 7 |
| | HIGH FLOWS | | | | | | | | |
| 02467000 | Tombigbee River at Demopolis Lock & Dam near Coatopa, Alabama | 15,400 | 61 | 104,100 (1946) | 248,000 (1961) | 129,100 | 286 | ...... | ... |
| 02479000 | Pascagoula River at Merrill, Mississippi | 6,590 | 59 | 50,030 (1966) | 176,000 (1961) | 59,225 | 352 | 104,300 | 23 |
| 03326500 | Mississinewa River at Marion, Indiana | 682 | 66 | 2,662 (1950) | 18,500 (1985) | 2,711 | 323 | 9,660 | 16 |
| 03451500 | French Broad River at Asheville, North Caroloina | 945 | 94 | 5,201 (1899) | 18,500 (1966) | 5,673 | 223 | 12,900 | 17 |

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged 1,457,000 cfs (41 percent above median and in the above-normal range) during February, 65 percent more than during January, and 25 percent more than during February 1989. Flow of both the St. Lawrence River and the Mississippi River was in the above-normal range and flow of the Columbia River was in the below-normal range. During January, flow of all three rivers was in the normal range. Hydrographs for both the combined and individual flows of the "Big 3" are on page 6. Dissolved solids and water temperatures at five large river stations are also given on page 6. Flow data for the "Big 3" and 42 other large rivers are given in the Flow of Large Rivers table on page 7.

Monthend index reservoir contents for February 1990 were in the below-average range (below the monthend average for the period of record by more than 5 percent of normal maximum contents) at 33 of 100 reporting sites, compared with 32 of 100 during January, including most reservoirs in Nebraska, the Dakotas, Wyoming, Montana, Idaho, California, Nevada and Colorado. Contents were in the above-average range at 46 reservoirs (compared with 45 last month) , including most reservoirs in New Hampshire, Massachusetts, New York, New Jersey, Pennsylvania, the Carolinas, Georgia, Alabama, the Tennessee Valley, Wisconsin, Minnesota, and Oklahoma. Reservoirs with contents in the below-average range and significantly lower than last year (with normal maximum contents of at least 1,000,000 acre-feet) were: Gouin, Quebec; International Amistad, International Falcon, and Lake Travis, Texas; Lake McConaughy, Nebraska; Fort Peck, Montana; the Pathfinder and associated reservoirs, Wyoming; Bear Lake, Idaho-Utah; and Lake Berryessa, California. Lake Tahoe (California-Nevada) had no usable storage at the end of the month for the third consecutive month, while Rye Patch (Nevada) and San Carlos (Arizona) had only 8 percent and 7 percent of normal maximum contents, respectively. The combined storage in 22 reservoirs in California's Central Valley was only 68 percent of the historical average on February 22 (California *Water Supply Outlook*, February 22, 1990, revised). Graphs of contents for seven reservoirs are shown on page 8 with contents for the 100 reporting reservoirs given on page 9.

Streamflow conditions during February 1990 and February 1989 are shown by maps on page 10. The spatial distribution of areas in the three flow ranges is dissimilar for the two months, but parts of the south-central United States are in the above-normal range during both months, and parts of the western and north-central United States are in the below-normal range during both months. There is also more area in the above-normal range and less area in the below-normal range during February 1990 than during February 1989. The locations of reservoirs with below-average contents at the end of February 1990 and February 1989 are also shown on the respective maps.

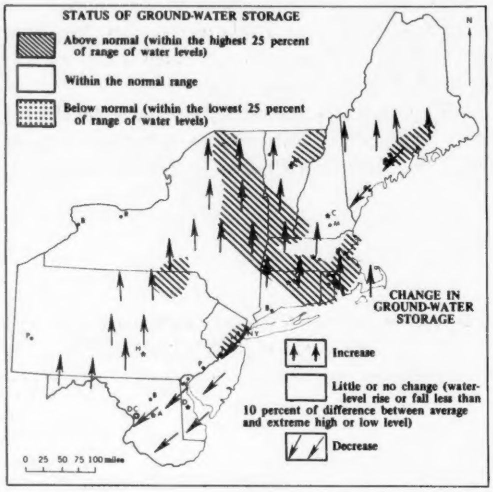
Mean February elevations at the four master gages on the Great Lakes (provisional National Ocean Service data) were in the below-normal range on Lake Superior and Lake Huron, and in the normal range on Lake Erie and Lake Ontario. Levels declined from those for January only on Lake Superior. February 1990 levels ranged from 0.21 foot lower (Lake Superior) to 0.70 foot higher (Lake Erie) than those for January. Monthly means have now been in the below-normal range for 5 months on Lake Superior and 2 months on Lake Huron. Monthly means have been in the normal range for 23 months on Lake Erie and 10 months on Lake Ontario. February 1990 levels ranged from 0.62 foot higher (Lake Ontario) to 0.69 foot lower (Lake Superior) than those for February 1989. Stage hydrographs for the master gages on Lake Superior, Lake Huron, Lake Erie, and Lake Ontario are on page 18.

Utah's Great Salt Lake (graph on page 18) remained at the January 31 level through February 15, then rose 0.10 foot February 16-28 to 4,204.60 feet above National Geodetic Vertical Datum of 1929. The lake which declined 2.40 feet from the seasonal high of April 1-15, has now risen 0.2 foot since January 1. Lake level is 2.00 feet lower than at the end of February 1989, and 7.25 feet lower than the maximum of record which occurred in June 1986 and March-April 1987.

# GROUNDWATER CONDITIONS DURING FEBRUARY 1990

Ground-water levels have begun to rise in the mid-section of the Northeast (see map), generally reversing trends of the previous month. Levels declined in the southern part of Maryland, Delaware, New Jersey, and also in southwestern Maine. Above-average water levels persisted in the central part of the region from northern New York to northeastern Massachusetts and Rhode Island and in smaller areas in central New York, northern Pennsylvania, northern New Jersey, northern Vermont, and southern Maine. Elsewhere, levels in most observation wells were within the range of water levels normally occurring near the end of February.

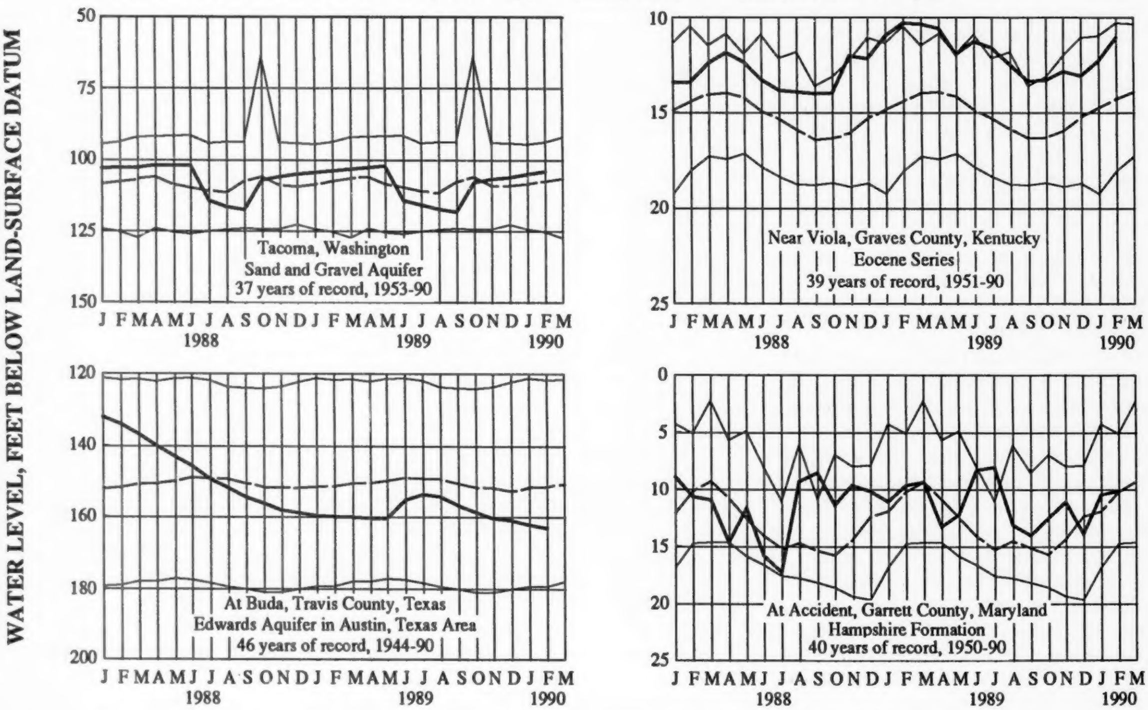
In the Southeastern States, ground-water levels rose in Kentucky, Virginia, and Mississippi. Net changes in levels were mixed elsewhere. Levels were above long-term averages in Kentucky, Virginia, and North Carolina, and below average in Arkansas, Louisiana, and most of Florida. Levels were mixed with respect to averages in Georgia. Water level rose to a new high in the key well at Glenville, Gilmer County, West Virginia. New February low levels occurred in the key well in Memphis, Tennessee; and also in the well on




Map showing ground-water storage near end of February and change in ground-water storage from end of January to end of February.

## MONTHEND GROUND-WATER LEVELS IN KEY WELLS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.



Cockspur Island, Savannah area, Georgia. Water level declined to an all-time low in the key well at Ruston, Louisiana.

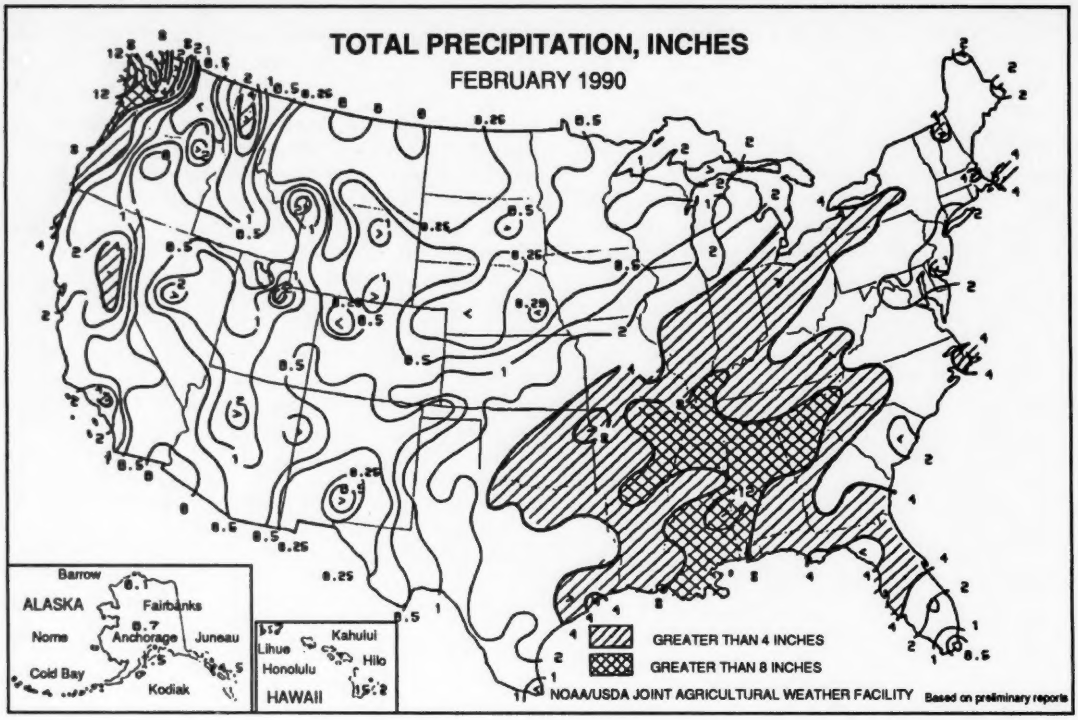
In the central and western Great Lakes States, ground-water levels rose in Ohio, and elsewhere were mixed with respect to January levels. Levels were below long-term averages in Minnesota and Iowa and mixed with respect to average in Michigan and Ohio.

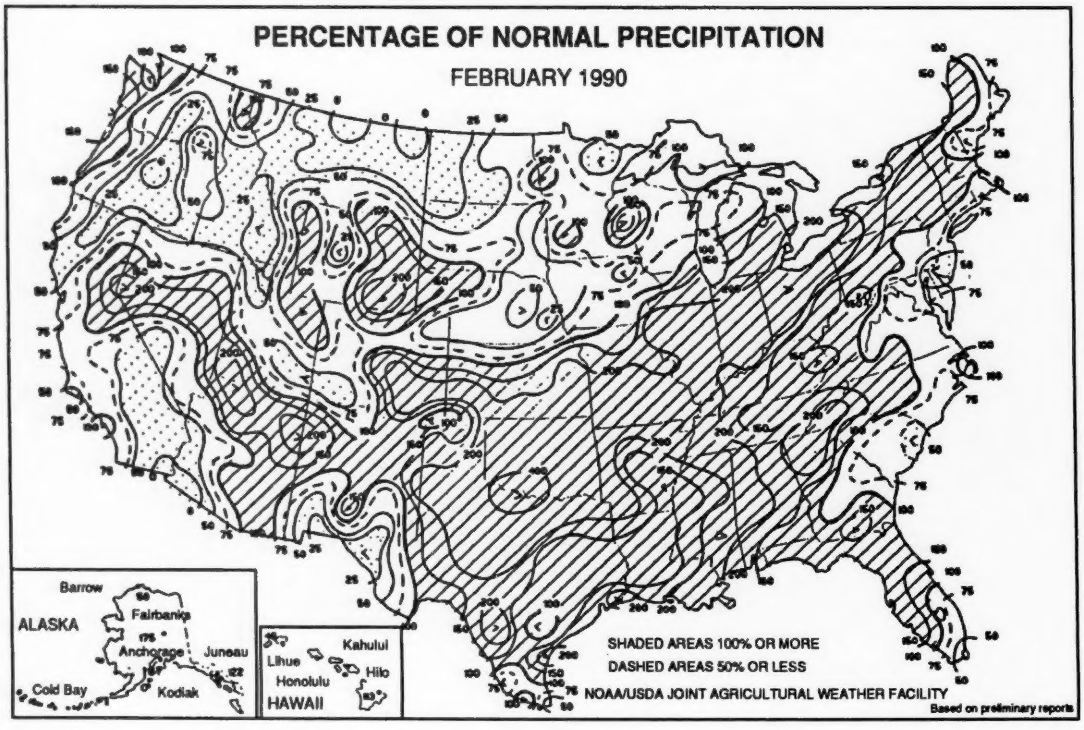
In the Western States, levels declined in Idaho. Mixed water-level changes occurred elsewhere. Levels were above average in Washington and below long-term averages in much of the region including Idaho, North Dakota, Nebraska, southern California, Kansas, Arizona, and Texas. Levels were mixed with respect to average in Nevada, Utah, and New Mexico. Level declined to a record low in the key well in Las Vegas Valley, Nevada. Despite net rises in water levels from last month, record lows also occurred in key wells in Dickinson, North Dakota; the Holladay area, Utah; in two wells in Kansas, at Halstead and Colby; and also in the Hueco Bolson aquifer at El Paso, Texas. An all-time high occurred in the Berrendo-Smith well in Chaves, New Mexico.

Provisional data; subject to revision

## WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES--FEBRUARY 1990

| Aquifer and Location | Water level in feet with reference to land–surface datum | Departure from average in feet | Net change in water level in feet since: Last month | Last year | Year records began | Remarks |
|---|---|---|---|---|---|---|
| Glacial drift at Hanska, south–central Minnesota ..... | –15.66 | –6.64 | +0.34 | –1.52 | 1942 | |
| Glacial drift at Roscommon in north–central part of Lower Peninsula, Michigan. | –5.82 | –0.87 | –0.07 | –1.13 | 1935 | |
| Glacial drift at Marion, Iowa ............................... | –8.26 | –2.46 | +1.36 | –0.20 | 1941 | |
| Glacial drift at Princeton in northwestern Illinois..... | –6.58 | +5.73 | +0.80 | +1.62 | 1943 | |
| Petersburg Granite, southeastern Piedmont near Fall Zone, Colonial Heights, Virginia. | –13.72 | +1.08 | +0.32 | +2.14 | 1939 | |
| Glacial outwash sand and gravel, Louisville, Kentucky (U.S. well no. 2). | –18.81 | +6.13 | +0.37 | +1.38 | 1946 | |
| 500–foot sand aquifer near Memphis, Tennessee (U.S. well no. 2). | –106.51 | –16.28 | +0.27 | –0.11 | 1941 | Feb. low |
| Weathered granite, Mocksville area, Davie County, western Piedmont, North Carolina. | –13.81 | +5.64 | +1.98 | +3.12 | 1932 | |
| Sparta Sand in Pine Bluff industrial area, Arkansas .. | –236.20 | –26.14 | –0.80 | +5.40 | 1958 | |
| Eutaw Formation in the City of Montgomery, Alabama (U.S. well no. 4). | –20.2 | –0.5 | +0.3 | +8.0 | 1952 | |
| Upper Floridan aquifer on Cockspur Island, Savannah area, Georgia (U.S. well no. 6). | –34.71 | –8.35 | –0.48 | –0.71 | 1956 | Feb. low |
| Sand and gravel in Puget Trough, Tacoma, Washington. | –104.26 | +3.25 | +0.87 | –0.36 | 1952 | |
| Pleistocene glacial outwash gravel, North Pole, northern Idaho (U.S. well no. 3). | –467.4 | –5.2 | ... | +3.0 | 1929 | |
| Snake River Group: Snake River Plain Aquifer, at Eden, Idaho (U.S. well no. 4). | –126.9 | –6.1 | –1.6 | +0.3 | 1957 | |
| Alluvial valley fill in Flowell area, Millard County, Utah (U.S. well no. 9). | –26.97 | –3.43 | +1.25 | –9.12 | 1929 | |
| Alluvial sand and gravel, Platte River Valley, Ashland, Nebraska (U.S. well no. 6). | –6.43 | –1.14 | +0.28 | +1.02 | 1935 | |
| Alluvial valley fill in Steptoe Valley, Nevada......... | –7.01 | +5.06 | +0.16 | –0.34 | 1950 | |
| Pleistocene terrace deposits in Kansas River valley, at Lawrence, northeastern Kansas. | –23.40 | –2.28 | +0.13 | +0.08 | 1953 | |
| Alluvium and Paso Robles clay, sand, and gravel, Santa Maria Valley, California. | –151.20 | –8.40 | +0.60 | –8.80 | 1957 | |
| Valley fill, Elfrida area, Douglas, Arizona (U.S. well no. 15). | –99.08 | –17.73 | +0.09 | +1.16 | 1951 | |
| Hueco bolson, El Paso area, Texas ...................... | –269.65 | –20.66 | +0.18 | –1.10 | 1965 | Feb. low |
| Evangeline aquifer, Houston area, Texas ............... | –301.98 | –4.38 | –5.79 | –1.65 | 1965 | |




(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility)

## FEBRUARY WEATHER SUMMARY

**HIGHLIGHTS:** Storm systems spread much above-normal precipitation from the central and southern Plains to the Appalachians and Piedmont. These storms gave needed moisture to much of the hard red winter wheat but,during the middle of the month, caused severe weather, tornadoes, and local flooding across the Gulf Coast States. Heavy snows also brought needed moisture to portions of the Intermountain Plateau and Rockies. Dry weather continued to plague much of the North Central States and southern Florida. Unseasonably warm weather prevailed over much of the eastern two-thirds of the Nation for the second month in a row. Blasts of arctic air, however, plunged into the Central States in mid-February and into the Eastern States at month's end. Temperatures dropped below freezing across central Alabama and central Georgia on the 26th.

**FEBRUARY 1-3:** A frontal system caused moderate to heavy rain from eastern Texas, across the Mississippi Valley, and into the Northeast and spread snow across the central Plains into the upper Great Lakes. Winter storms batterred the Pacific Northwest with strong wind and precipitation, and brought heavy snow to the southwest.

**FEBRUARY 4-10:** Unseasonable warmth persisted over the east ern two-thirds of the Nation, where temperatures ranged from 6 to 18° Fahrenheit (F) above normal. Record-high temperatures for the date were broken from the Dakotas to the Atlantic coast. Near- to below-normal temperatures remained in the Great Basin and Southwest, while bitter polar air settled over interior Alaska. Temperatures dropped to -45° F at Fairbanks and -58° F at Fort Yukon. Wet and windy weather continued throughout the week across the Pacific Northwest. During the latter part of the week, a strong frontal system brought severe weather to the Southeast as thunderstorms spawned at least 13 tornadoes. The system spread heavy rain from the lower Mississippi Valley to the northern and middle Atlantic coast. Dry conditions prevailed over the Great Plains and western Corn Belt.

**FEBRUARY 11-17:** Winter returned to the northern and central Plains, as arctic air plunged south and reversed the warm spell of the last 2 months. The week started with above-normal temperatures throughout most of the country and heavy rains across portions of Florida. The cold air spread southward into the central Plains on Wednesday and spawned widespread precipitation across the Mississippi Valley. The Plains received 2-8 inches of snow, with higher amounts in northern Illinois. The snow cover protected much of the Plains' winter wheat from the subsequent low temperatures. Even Arizona and California remained unscathed as freezing temperatures were reported throughout that area.

San Francisco reported light snow on Wednesday. Though the snow immediately melted, it was the first there since 1976. The temperature at Fresno, CA, on Thursday morning was 24° F, a record-low temperature for the date. Warm air overrunning the cold air produced a band of freezing rain from Kansas to New England on Thursday. Severe weather, heavy rain, and local flooding affected portions of the lower Mississippi Valley and the Southeast on Friday. Beneficial rain of 1-2 inches fell across southern California on Saturday.

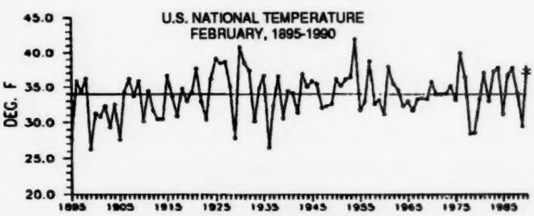
**FEBRUARY 18-24:** Early in the week, heavy rain fell across the Delta and Southeast, while a winter storm spread snow over the central and southern Plateau, Rockies, and into the High Plains. At midweek, showers gave beneficial precipitation to the hard red winter wheat region in the central and southern Plains. Frontal systems then spread substantial rain and snow across the lower and middle Mississippi Valley to the Atlantic seaboard. Heavy rain caused local flooding in the Gulf Coast States and snow blanketed the Great Lakes, eastern Corn Belt, and Northeast. Record-low temperatures for the date were reported along the Pacific Coast States early in the week, while record-high temperatures occurred along the Atlantic Coast States during the latter part of the week. By Saturday, however, cold arctic air moved into the eastern half of the Nation, dumping heavy snow on much of the Northeast and bringing the lowest temperatures since December into the region.

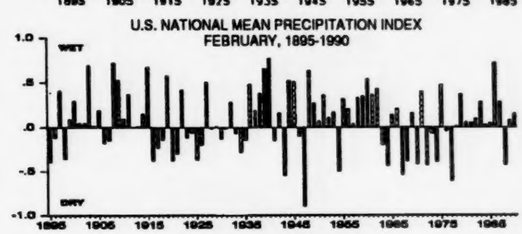
**FEBRUARY 25-28:** Cold arctic air continued to invade the Atlantic seaboard as freezing temperatures dipped into central Georgia and 13 stations reported record-low temperatures on the 26th. At month's end, a winter storm moved out of the southern Rockies and brought heavy rain and snow to much of the hard red winter wheat in the central and southern Plains.

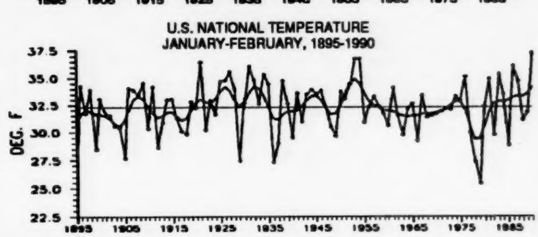
## FEBRUARY WEATHER IN HISTORICAL PERSPECTIVE

February 1990 was mild and wet across much of the country. National temperatures about 3° F above normal made this the 15th warmest February on record, according to preliminary data. The precipitation index places this February as the 23rd wettest on record. February 1990 ranked as the third warmest February on record in the Southeast. The South had the third wettest February on record, while the West North Central region had the third driest February.

The year so far has been unusually mild. The January-February mean temperature ranks 1990 as the warmest January-February period on record. This follows the fourth coldest December. The smooth line is a nine-point binomial filter that averages the year-to-year fluctuations and shows the longer term variations. It indicates that the last 10 years have seen a slow warming since the extreme cold of the late 1970's.

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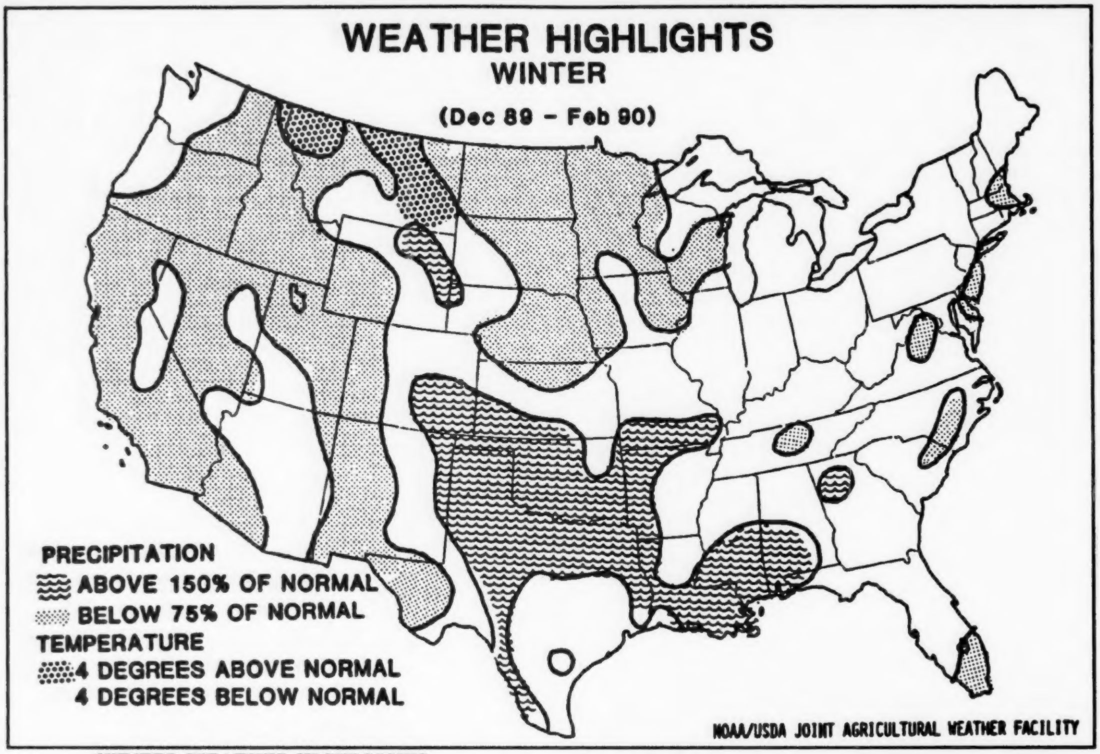



## WINTER WEATHER HIGHLIGHTS

December's record cold, followed by January and February's record warmth, highlighted the season's weather. The turnaround was dramatic. December's temperatures made it the fourth coldest December on record, while January's abrupt change to higher temperatures made it the warmest January since national records began in 1895. February's mildness was somewhat less pervasive, with the month ranking 15th nationally. The upshot was that most of the United States east of the Continental Divide averaged warmer-than-normal temperatures for the 3 months combined, while below-normal temperatures were mainly confined to California and the southern High Plains.

Ample precipitation in Kansas, Oklahoma, and Texas helped the hard red winter wheat region recover from the autumn drought, while excessive rains in the South triggered floods. Below-normal precipitation in the western Corn Belt and northern Plains' spring wheat region allowed long-term drought to persist in those farming regions. California had below-average precipitation for the fourth consecutive winter.

## WINTER PRECIPITATION IN HISTORICAL PERSPECTIVE

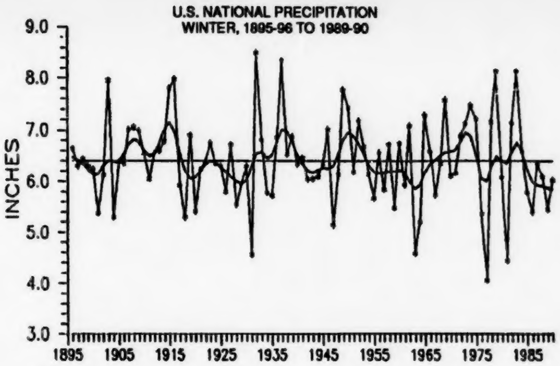
Areally-averaged precipitation for the nation was below the long-term mean, with winter 1989-90 ranking as the 26th driest winter on record. This marks the sixth consecutive below-normal winter for the nation, which follows a period of extreme year-to-year swings in winter precipitation. The filtered curve suggests that the cumulative dryness of the last six years equals the previous cumulative dry periods in this century.

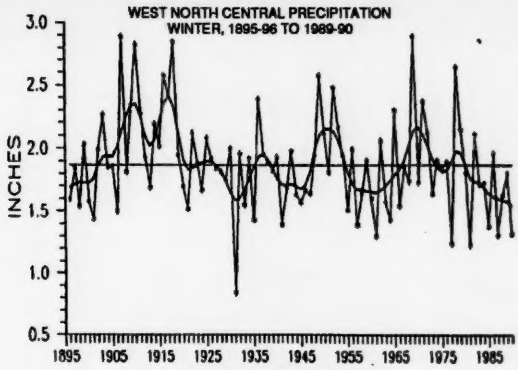
Historical precipitation is shown in a different way below the areally-averaged graph. The winter (December through February) precipitation for each climate division in the country was first standardized using the gamma distribution over the 1951-80 period. These standardized values were then weighted by area and averaged to determine a national standardized precipitation value. Negative values are dry, positive are wet. This index gives a more accurate indication of how precipitation across the country compares to the local normal climate. The areally-weighted mean standardized national precipitation ranks winter 1989-90 as the 27th driest winter on record. Two of the three driest winters, by this index, occurred in the last 15 years: 1976-77 ranks as the driest winter, 1930-31 as second driest, and 1980-81 as third driest.

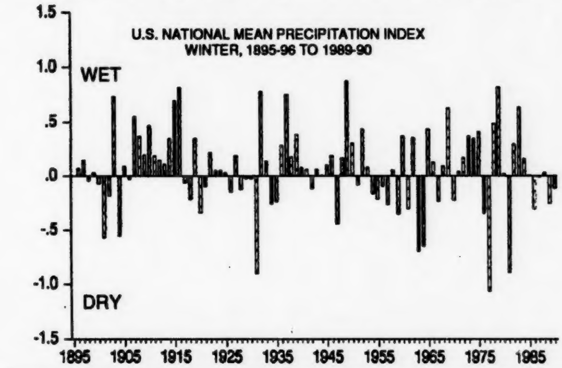
Winter dryness has persisted for the last 4 to 8 years in several regions. Nine of the last eleven winters in the Northeast region have been drier than the long-term mean. The filtered curve for the Northeast has reached an alarmingly low level. Precipitation has been below the long-term mean for the last four years in the West North Central region. The filtered curve suggests that the cumulative dryness has surpassed the intensity of previous dry periods. It also indicates that the maximum winter wetness for this region occurred in the early part of the century. In the Northwest region, the dryness of the last four years contrasts with the frequent wetness of the last four decades. The filtered curve for the West region indicates a decreasing trend in winter precipitation over the last ten years.

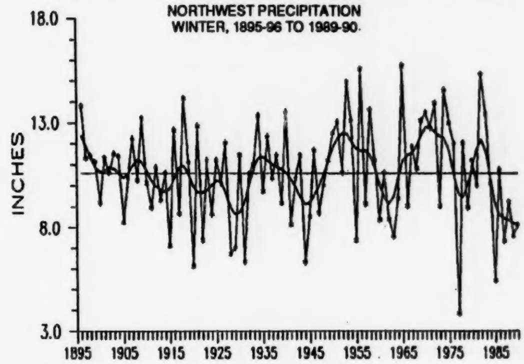
Ten States had the tenth driest, or drier, winter on record in 1989-90. These include Delaware, Idaho, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, North Dakota, Rhode Island, and Wyoming. Of these, North Dakota had the driest winter on record. Four States (Alabama, Louisiana, Mississippi, and Oklahoma) had the tenth wettest, or wetter, winter on record in 1989-90.

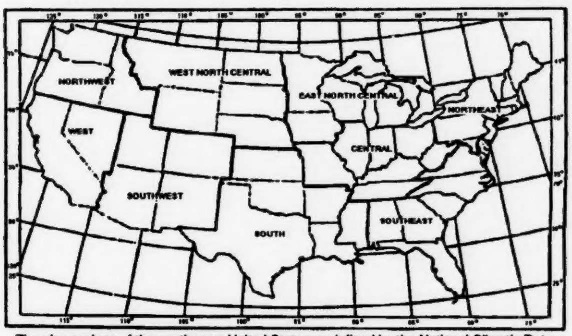
(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility)



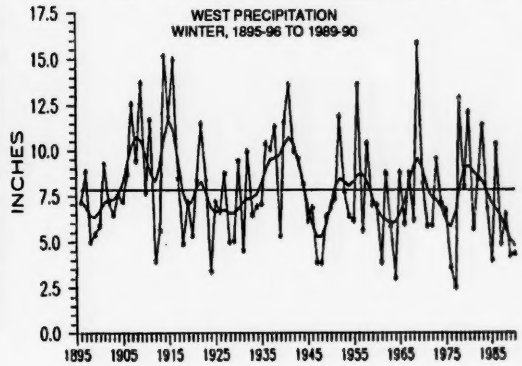



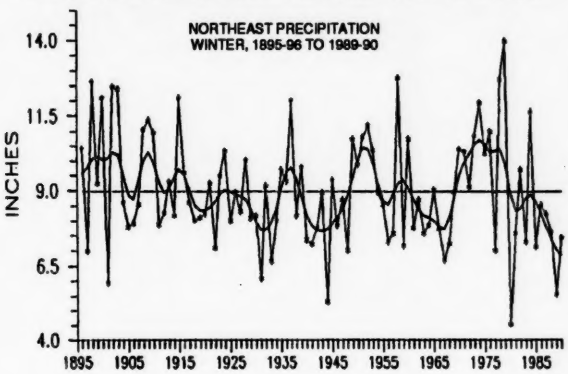




The nine regions of the contiguous United States as defined by the National Climatic Data Center (NCDC) and described within the U.S. monthly climate summary text and figures.



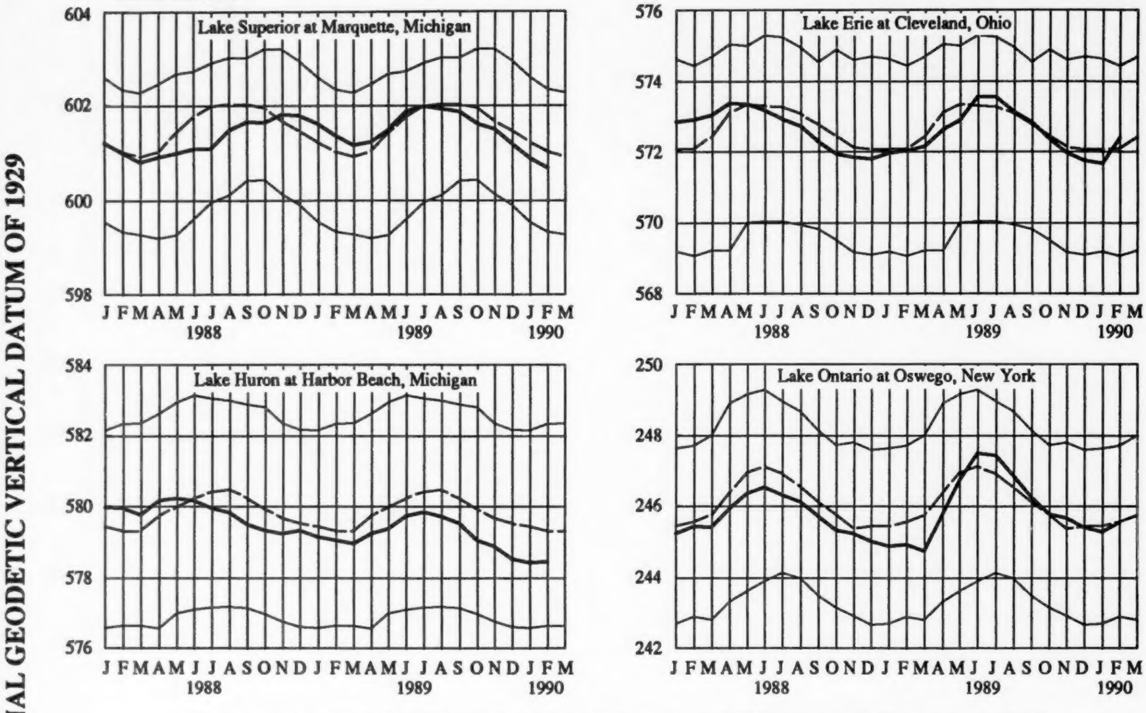

PRECIPITATION RANKINGS FOR DECEMBER 1989-FEBRUARY 1990, BASED ON THE PERIOD 1895-96 TO 1989-90. 1=DRIEST, 95=WETTEST.

| STATE | RANK | STATE | RANK | STATE | RANK | STATE | RANK |
|---|---|---|---|---|---|---|---|
| AL | 94 | IA | 12 | NE | 18 | RI | 7 |
| AZ | 17 | KS | 71 | NV | 12 | SC | 44 |
| AR | 61 | KY | 56 | NH | 6 | SD | 21 |
| CA | 12 | LA | 90 | NJ | 7 | TN | 41 |
| CO | 24 | ME | 23 | NM | 28 | TX | 44 |
| CT | 30 | MD | 10 | NY | 43 | UT | 16 |
| DE | 3 | MA | 5 | NC | 61 | VT | 14 |
| FL | 53 | MI | 28 | ND | 1 | VA | 21 |
| GA | 64 | MN | 5 | OH | 67 | WA | 33 |
| ID | 4 | MS | 91 | OK | 89 | WV | 27 |
| IL | 58 | MO | 73 | OR | 15 | WI | 16 |
| IN | 63 | MT | 32 | PA | 45 | WY | 6 |

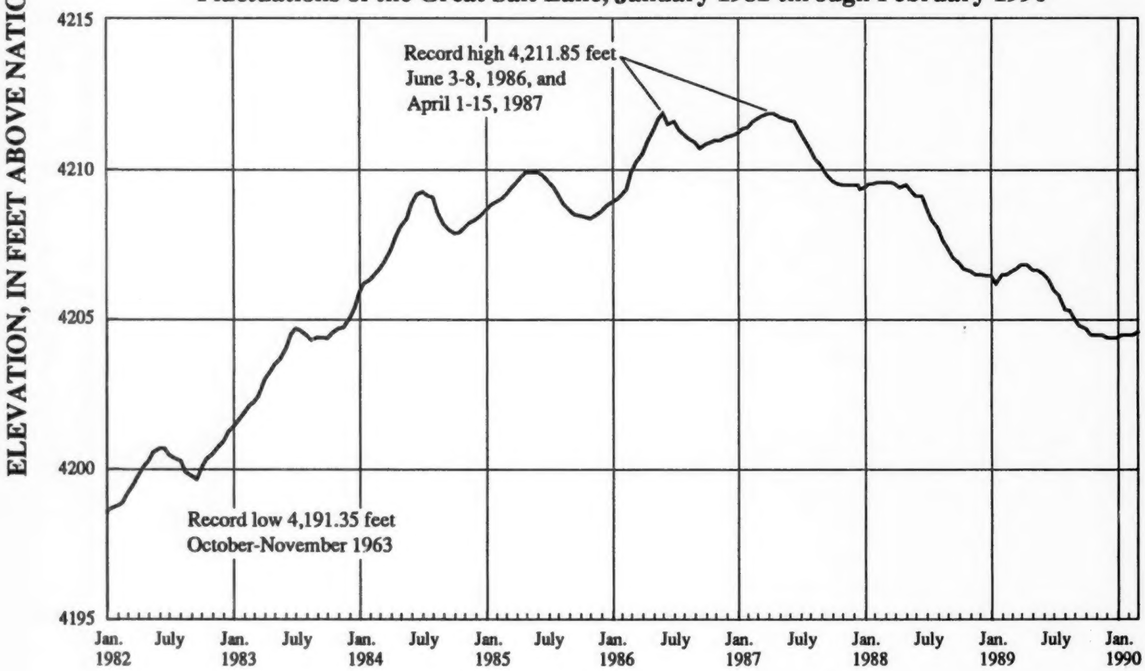
(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Facility)

## GREAT LAKES ELEVATIONS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period. Data from National Ocean Service.

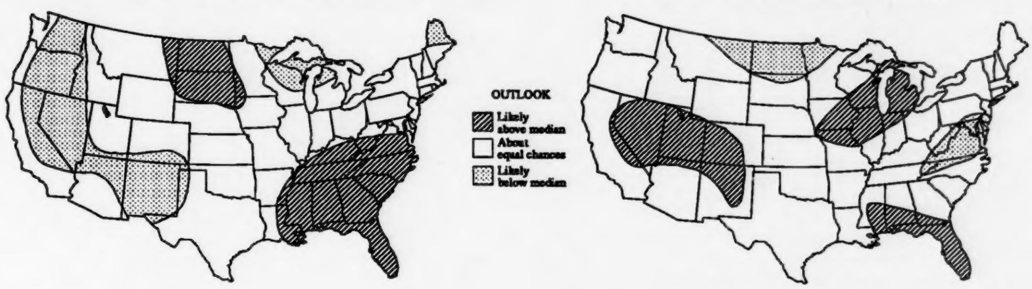



### Fluctuations of the Great Salt Lake, January 1982 through February 1990



TEMPERATURE OUTLOOK FOR MARCH-MAY 1990

PRECIPITATION OUTLOOK FOR MARCH-MAY 1990




## NATIONAL WATER CONDITIONS

## FEBRUARY 1990

Based on reports from the Canadian and U.S. Field offices; completed March 19, 1990

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## EXPLANATION OF DATA (Revised December 1989)

***Cover map*** shows generalized pattern of streamflow for the month based on provisional data from 186 index gaging stations—18 in Canada, 166 in the United States, and 2 in the Commonwealth of Puerto Rico. Alaska, Hawaii, and Puerto Rico inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows. Classifications on map are based on comparison of streamflow for the current month at each index station with the flow for the same month in the 30-year reference period, 1951-80. Shorter reference periods are used for one Canadian index station, two Kansas index stations, and the Puerto Rico index stations because of the limited records available.

The ***streamflow ranges map*** shows where streamflow has persisted in the above- or below-normal range from last month to this month and also where streamflow is in the above- or below-normal range this month after being in a different range last month. Three ***pie charts*** show: the percent of stations reporting discharges in each flow range for both the conterminous United States and southern Canada, and also the percent of area in each flow range for the conterminous United States and southern Canada. The ***bar graph*** shows total mean and total median flow for all reporting stations in the conterminous United States and southern Canada.

The comparative data are obtained by ranking the 30 flows for each month of the reference period in order of decreasing magnitude—the highest flow is given a ranking of 1 and the lowest flow is given a ranking of 30. Quartiles (25-percent points) are computed by averaging the 7th and 8th highest flows (upper quartile), 15th and 16th highest flows (middle quartile and median), and the 23rd and 24th highest flows (lower quartile). The upper and lower quartiles set off the highest 25 percent of flows and lowest 25 percent of flows, respectively, for the reference period. The median (middle quartile) is the middle value by definition. For the reference period, 50 percent of the flows are greater than the median, 50 percent are less than the median, 50 percent are between the upper and lower quartiles (in the normal range), 25 percent are greater than the upper quartile (above normal), and 25 percent are less than the lower quartile (below normal). Flow for the current month is then classified as: in the ***above-normal range*** if it is greater than the upper quartile, in the ***normal range*** if it is between the upper and lower quartiles, and in the ***below-normal range*** if it is less than the lower quartile. Change in flow from the previous month to the current month is classified as ***seasonal*** if the change is in the same direction as the change in the median. If the change is in the opposite direction of the change in the median, the change is classified as ***contraseasonal*** (opposite to the seasonal change). For example: at a particular index station, the January median is greater than the December median; if flow for the current January increased from December (the previous month), the increase is seasonal; if flow for the current January decreased from December, the decrease is contraseasonal.

***Flood frequency analyses*** define the relation of flood peak magnitude to probability of occurrence or recurrence interval. ***Probability of occurrence*** is the chance that a given flood magnitude will be exceeded in any one year. ***Recurrence interval*** is the reciprocal of probability of occurrence and is the average number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. ***Recurrence intervals imply no regularity of occurrence***; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about ***ground-water levels*** refer to conditions near the end of the month. The water level in each key observation well is compared with average level for the end of the month determined from the 30-year reference period, 1951-80, or from the entire past record for that well when only limited records are available. Comparative data for ground-water levels are obtained in the same manner as comparative data for streamflow. ***Changes in ground-water levels***, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data are given for five stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). ***Dissolved solids*** are minerals dissolved in water and usually consist predominately of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. ***Dissolved-solids discharge*** represents the total daily amount of dissolved minerals carried by the stream. ***Dissolved-solids concentrations*** are generally higher during periods of low streamflow, but the highest dissolved-solids discharges occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

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